Rexrode

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How to

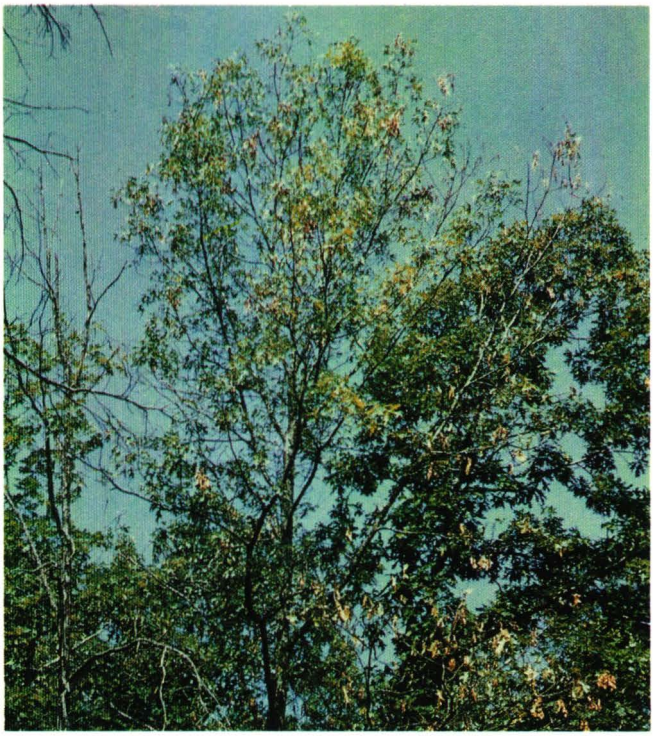
Identify Oak Wilt

The Disease

What is Oak Wilt?

Oak wilt is an aggressive tree-killing disease of oaks. It is caused by the fungus *Ceratocystis fagacearum* (Bretz) Hunt which enters the water-conducting vessels of the sapwood through fresh wounds or through roots connecting healthy and diseased trees. When the fungus is in the vessels adjacent cells develop structures called tyloses which extend into the vessels and plug them. This disrupts the sap flow in the vessels, and the foliage wilts and falls (Figs. 1 and 2). The disease is a threat to all oaks, but trees of the red oak group (red, black, scarlet, and pin oaks) are killed more rapidly than trees of the white oak group (white, bur, post, and overcup oaks).

Figure 1.—Wilting oak tree.



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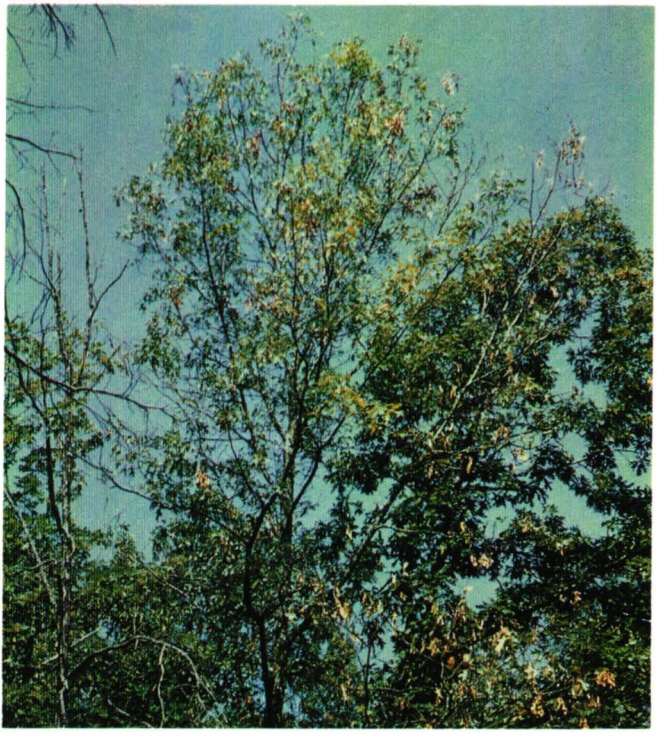


Figure 2.—Fallen leaves from oak wilt infected tree.

Symptoms

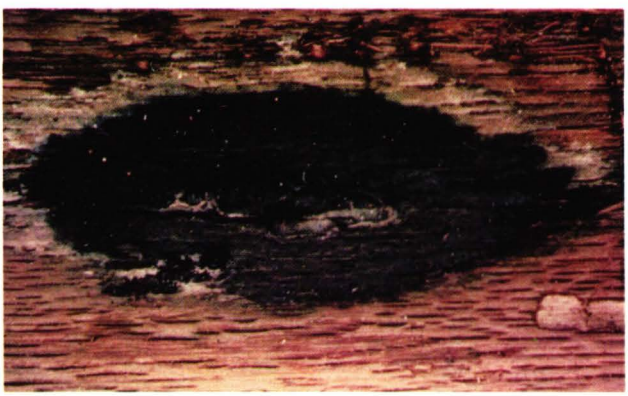
Red Oak Group

Early foliar symptoms are wilting, bronzing, and shedding of the leaves at the ends of branches in the upper crown. These symptoms quickly progress throughout the crown, often within a few weeks.

The bronzing of leaves begins at the tip and outer edges of the leaf blade and spreads to the midrib and base. The line between bronze tissue and green tissue in individual leaves is very distinct (Fig. 3). Also, the leaves typically tend to curl around the midrib. Heavy defoliation accompanies leaf discoloration and wilting, and leaves will fall in all stages of discoloration; entirely green leaves also may fall. However, diseased trees or branches usually hold some discolored leaves until autumn. Fungus mats—layers of tightly woven fungal strands between the bark and wood which produce spores—and pressure cushions—thick, cushion-like structures near the center of each mat that create enough pressure to raise and rupture the bark, thereby creating a chamber where mats develop and give off a fruity odor—are commonly associated with red oaks (Fig. 4). Discoloration of the infected annual rings is seldom an internal symptom of oak wilt in oaks of the red group.

Figure 3.—Symptoms of oak wilt on red oak leaves.

Figure 4.—Fungus mat on red oak.



White Oak Group

Symptoms of oak wilt are much more variable in white oaks than red oaks. The pattern of symptom progression in some white oaks, particularly bur oak (Fig. 5), may be the same as that in the red oaks. The infected red oaks will die within one growing season. But in most infected members of the white oak group, only one or a few branches will display symptoms and die in a year. Leaf discoloration may be similar to that in the red oak group or may be limited to only a few completely yellow leaves. Leaf fall, when it occurs, is like that in the red oak group. Also, discoloration of the infected annual rings may be an internal symptom of oak wilt in trees of the white oak group (Fig. 6).

Figure 5.—Symptoms of oak wilt on bur oak leaves.

Figure 6.—Internal symptoms of oak wilt in white oak.

Isolation

Laboratory Culturing

Experienced observers can usually recognize oak wilt by the foliar symptoms. However, positive confirmation can be made only by isolation and identification of *C. fagacearum* from wood (Fig. 7). The fungus is sometimes difficult to isolate from samples taken from diseased trees, especially during hot weather. The fresh samples for isolation should be stored in an ice chest or refrigerator until cultured.

Charles O. Rexrode, Principal Entomologist, Northeastern Forest Experiment Station, Delaware, Ohio 43015

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Figure 7.—Two methods for isolating the oak wilt fungus.

Cut a branch with wilting leaves. Cut a twig 6-10" long and about 1" in diameter with inner bark fresh and green

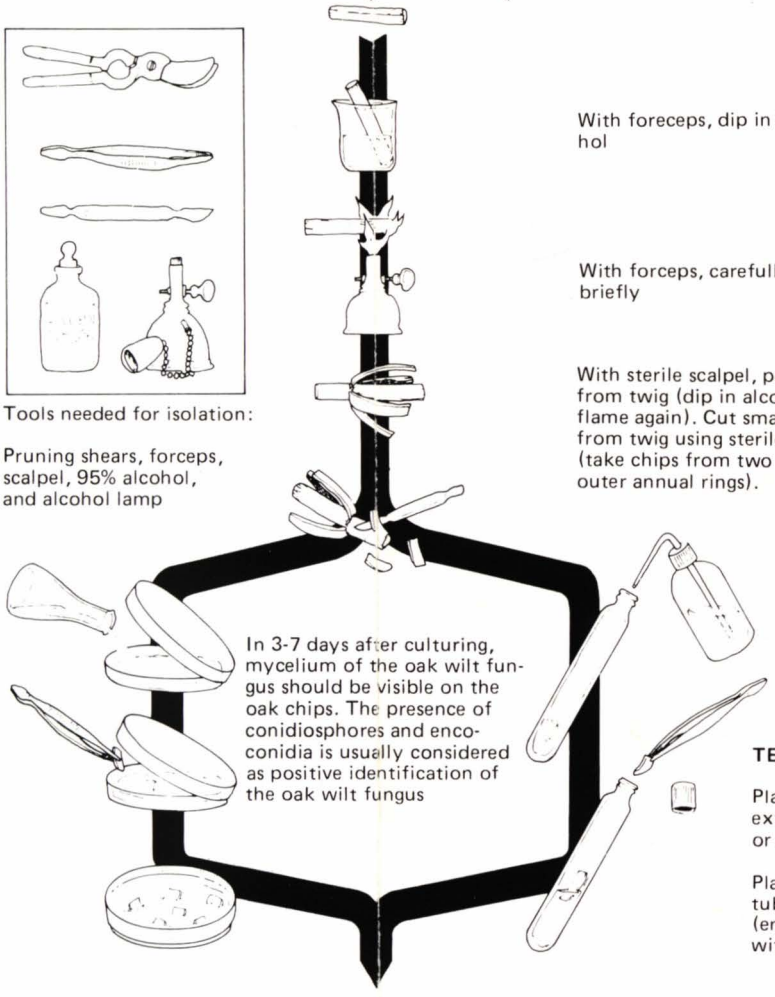
Tools needed for isolation:

Pruning shears, forceps, scalpel, 95% alcohol, and alcohol lamp

With foreceps, dip in 95% alcohol

With forceps, carefully flame very briefly

With sterile scalpel, peel bark from twig (dip in alcohol and flame again). Cut small chips from twig using sterile scalpel (take chips from two or three outer annual rings).



In 3-7 days after culturing, mycelium of the oak wilt fungus should be visible on the oak chips. The presence of conidiosphores and encoconidia is usually considered as positive identification of the oak wilt fungus

AGAR METHOD[2]

Pour melted agar in plate (PDA, Malt, etc.)

Distribute 3-5 chips on cooled plate

Incubate at room temperature for 3-7 days (Mycelium will appear in this time)

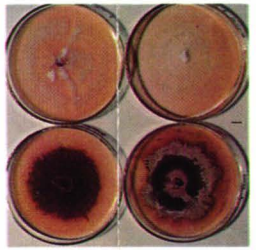
TEST TUBE METHOD

Place malt extract, potato extract, sucrose-asparagine or distilled water in tube

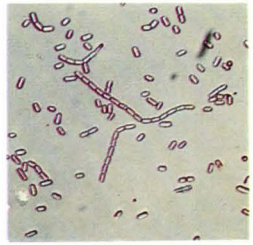
Place several chips in test tube using sterile forceps (endoconidia will develop within 4-5 days)

[2]Barnett, H. L. 1952. A rapid method for determining oak wilt. Phytopathology 42:57.

Conidiosphores producing encoconidia



Two-to-8-week-old culture of *C. fagacearum* on agar plate



Endoconidia of the oak wilt fungus